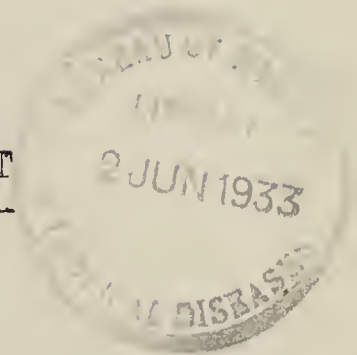


A N N U A L R E P O R T

O F T H E

S U D A N V E T E R I N A R Y S E R V I C E

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C O N T E N T S
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	Page
<u>SECTION I.</u>	
Diseases of Animals	5
<u>SECTION II.</u>	
Trade in Livestock and Livestock Products	14
<u>SECTION III.</u>	
Improvement of Livestock	19
<u>SECTION IV.</u>	
Miscellaneous	21
<u>APPENDIX</u>	
Report of the Veterinary Research Officer	24

S T A F F.

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It is regretted that, during the period under review, the financial position was such as to necessitate still further reductions of the Veterinary Staff.

The establishment of Veterinary Inspectors was reduced from fifteen to twelve last year and it has since been reduced to ten while the post of Assistant Director has been abolished.

Mr. W. Gray, Veterinary Inspector, resigned from the service on June 5th. and the contracts of two other Veterinary Inspectors were terminated, one on June 29th and the other on October 5th., in order to effect the reduction of staff called for.

The distribution of the Veterinary Staff on 31st. December, 1932, was as follows :-

N A M E	DESIGNATION	STATION
Mr. W. Kennedy, D.S.O.	Director	Khartoum
---O*O---		
Mr. S.C.J. Bennett, B.Sc.	Veterinary Research Officer.	Khartoum
Mr. J.T.R. Evans, B.Sc.	Assistant Veterinary Research Officer	Malakal
---O*O---		
Capt. R.S.Audas, M.C., 3N.	Veterinary Inspector	El Fasher
Capt. J. Going, 4N.	" "	Kassala
Capt. C.P. Fisher, 4N.	" "	El Dueim
Major J.R. Ellison, 4N.	" "	Singa
Capt. T.Menzies, D.V.S.M. (Vict)	" "	Khartoum
Capt. H.B. Williams, O.B.E.	" "	El Obeid
Capt. L.E. Prichard, O.B.E.	" "	Wad Medani
Mr. W.H. Glanville	" "	Malakal
Mr. J.E. Furney	" "	Wad Medani
Mr. J.A. Gillespie	" "	El Obeid

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Further reductions of British personnel were effected by the retrenchment of Mr. G. Barnett, M.B.E., Superintendent of the Civil Veterinary Hospital, Khartoum, after 20 years' service and of Mr. G. Latham, Superintendent of the Breeding Section, Khartoum North, after 19 years' service.

HONOURS & DECORATIONS.

Honours and decorations, as shown below, were recently conferred on the following members of the Veterinary Staff :-

Capt. R.S. Audas, M.C.	Order of the Nile, 3rd Class
Capt. C.F. Fisher	Order of the Nile, 4th. Class
Major J.R. Ellison	Order of the Nile, 4th. Class
Mr. H.A. McLoghry	Order of the Nile, 5th. Class
Mr. G. Barnett	(Order of the Nile, 5th. Class (Member of the Order of the British Empire.
Sol Mohamed Eff. Abu Bakr.	Meritorious Service Medal of the British Empire Order

VETERINARY POLICE.

The reduction of the Veterinary Police Force to one third of its original strength, as foreshadowed in last year's report, was effected early in the year and, on December 31st., the Force was finally abolished. Most of the non-commissioned officers and men who were discharged at the end of the year, have accepted employment as Native Stock Inspectors in which capacity their training in veterinary and police work will stand them in good stead.

TRIBAL VETERINARY ORGANIZATIONS.

The reports received from Veterinary Inspectors on the work carried out by the veterinary tribal retainers are generally favourable and, with more experience, their services will undoubtedly prove of great value to both the stock-owning tribes and the Veterinary Service.

S E C T I O N I.DISEASES OF ANIMALS.I. DISEASES OF CATTLE.General.

With the exception of Darfur Province cattle disease was not nearly so prevalent as last year. In the case of cattle plague a decreased incidence of the disease was only to be expected after its widespread occurrence in recent years since the decrease is largely attributable to the supply of susceptible cattle having been temporarily exhausted. It is anticipated that the improvement registered this year will be still more marked in next year's returns but it is hoped that this may not engender a feeling of false security. New generations of cattle susceptible to the disease will soon be produced and if, in the meantime, action cannot be taken to strengthen the veterinary defences of the country the native stock-owners will once more be faced with the very real danger of having their herds decimated by disease.

Livestock plays such an important part in the lives and customs of the people of this country that it is in the best interests of Government, from a political as well as from an economic point of view, to provide veterinary services commensurate to the needs of the community.

There are various directions in which additional staff and facilities would greatly increase the efficiency of the Veterinary Service and it is hoped that, when the financial position improves sufficiently to permit of a slight loosening of the purse-strings, the urgent veterinary requirements, both laboratory and field, will not be overlooked.

Cattle Plague.

The total number of deaths recorded this year from cattle plague was 8,812 which is a marked improvement on the total of 16,812 registered last year.

The only area in which the disease became uncontrollable for a time was Darfur Province where 5,000 deaths were reported, nearly 60 per cent. of the total recorded in the whole country.



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The course pursued by the disease in the principal cattle-breeding areas during the past four years leads one to conclude that, for the time being, the epizootic has about spent itself, nevertheless, the reports received of the various outbreaks dealt with during the year indicate that the losses would have been nearly as heavy as those of last year but for the provision of adequate supplies of cattle plague anti-serum. Due credit must also be given to the good work carried out by the tribal veterinary staffs as a result of the training given and experience gained in the previous year.

Kordofan Province was singularly free of cattle plague during the first quarter of the year but, as the dry season advanced and the herds concentrated on the permanent well centres, several extensive outbreaks occurred. After the rains the Humr tribe lost a considerable number of cattle through fearing to report the presence of disease lest it should interfere with the seasonal movement of their herds. The Messeria tribe were more fortunate than usual and suffered few losses.

In Darfur Province the heaviest losses occurred in the Northern District which had been free of the disease for five years.

Cattle plague was prevalent throughout the year in the provinces of White Nile, Blue Nile, Kassala and the Fung but the losses suffered were small compared with those of last year.

Heavy losses are reported to have occurred in Bahr-el-Ghazal Province during the year, particularly in Rumbek District. A supply of cattle plague anti-serum was sent to Wau in October in response to a request from the province authorities. This was used in dealing with a local outbreak but, unfortunately, the disease was well established before the serum arrived and, altogether, 82 Government-owned animals succumbed to the disease.

In Upper Nile Province, as might be expected after the widespread existence of cattle plague during the past two years, outbreaks of the disease were few and, in most cases, not serious. As far as could be ascertained this province was free of the disease at the end of the year. Considerable progress was made in convincing the natives of the benefits to be derived from the application of modern veterinary methods to the control of disease.

The consolidated returns of outbreaks of cattle plague for the past four years are given below :-

Year	No. of Outbreaks	No. of cattle involved	No. of deaths
1929	795	124,406	12,743
1930	981	180,540	15,425
1931	882	177,745	16,812
1932	503	139,122	8,812

No reliable statistics of the diseases of animals which occur in Bahr El Ghazal and Mongalla Provinces are available as no veterinary staff is posted to these provinces. In the case of the Upper Nile Province the Veterinary Inspector stationed there has had to limit his activities mainly to such districts as are accessible by river or motor transport and, owing to lack of staff, he can only furnish reports on the general conditions prevailing in the particular areas visited by him.

The majority of the serious outbreaks of disease which occur in Darfur and Kordofan Provinces are traceable to contact with diseased cattle on the northern border of Bahr El Ghazal Province. This contact is unavoidable since, towards the end of the dry season, vast herds of cattle from Southern Darfur and Southern Kordofan are compelled, through lack of water elsewhere, to congregate on the river, the Bahr el Arab, which forms the northern boundary of Bahr El Ghazal Province. It follows, therefore, that if efficient protection is to be afforded to the herds of Darfur and Kordofan Provinces, it will be necessary to detail veterinary staff to control the infectious diseases prevalent in Bahr El Ghazal Province.

The method generally adopted in recent years to control the various outbreaks of cattle plague which have come under notice has been to stop all movement of cattle from the infected areas and to administer cattle plague anti-serum to all susceptible and apparently healthy cattle involved. At the same time the serumized cattle are infected with the disease by smearing their nostrils with infective material from the sick animals. The object of this procedure is to cause the treated animals to undergo a mild, non-fatal attack of the disease and thereby to confer on them a life-long immunity. This method has been adopted with marked success in all outbreaks where the existence of the disease has been promptly reported, but little can be done to control the disease in a herd after it has obtained a firm foothold, for the administration of serum to cattle already infected does not influence the course of the disease to any appreciable extent. As the successful control of disease is so dependent on the early discovery of outbreaks, the need for an efficient veterinary intelligence service, organized on a tribal basis and operating throughout the cattle-breeding areas of the country, will be readily appreciated. Steady progress has been made during the past two years in training selected tribal retainers to carry out such veterinary duties as they can be trusted to perform, and the degree of efficiency with which such duties will be discharged now depends largely on the interest that will be taken in their work by the tribal authorities concerned.

Although the buildings at the Malakal Serum Laboratory were planned originally to allow of the annual production of only 3,000 litres of cattle plague anti-serum, it was decided, in view of the heavy demand, to attempt to produce 5,000 litres this year. In the end it was found possible to prepare over 4,700 litres of serum of high potency which proved sufficient not only to supply all demands from the field but to permit, for the first time, of an adequate reserve being held.

Some important observations on the technique of serum production were carried out at Malakal during the year and the deterioration of cattle plague vaccine under selected conditions of storage was studied in the Khartoum Laboratory. Further reference to these subjects will be found in the appended report of the Veterinary Research Officer. It is hoped that it will be possible in the near future to determine accurately the duration of the immunity conferred by cattle plague vaccine for, without this information, it is impossible to assess the true value of vaccine in the control of the disease.

Contagious Bovine Pleuro-Pneumonia.

The provinces of Khartoum, Blue Nile and Fung were free of pleuro-pneumonia throughout the year and a marked improvement in the incidence of the disease was registered in Kordofan and Kassala Provinces. Unfortunately the disease obtained a firm foothold in many parts of Darfur Province before its presence was reported and, in some herds, losses amounting to over 11 per cent. were recorded. Owing to shortage of staff this Province was without a Veterinary Inspector for nearly half the year.

Several outbreaks of pleuro-pneumonia occurred in the Southern District of White Nile Province but no great difficulty was experienced in controlling them and the total losses did not exceed $2\frac{1}{2}$ per cent. of the infected herds.

This disease assumed epizootic proportions during the year in the districts of Bor and Yirol, Upper Nile Province, and caused very heavy losses. In Yirol district tribal retainers were trained to carry out vaccinations against pleuro-pneumonia and over 10,000 cattle had been vaccinated by the end of the year when it was hoped that the further spread of the disease had been checked. The total number of cattle vaccinated in Upper Nile Province during the year was 17,249.

Excluding the Provinces of Bahr El Ghazal, Upper Nile and Mongalla, the mortality recorded from pleuro-pneumonia during the past four years was as follows :-

1929	.....	1,340	deaths
1930	.....	494	"
1931	.....	1,382	"
1932	.....	* 1,328	"

* 1,035 of these deaths were recorded in Darfur Province.

To meet the requirements of the veterinary staff in dealing with the various outbreaks which came under notice 31,200 doses of vaccine were issued from the Veterinary Laboratory during the year. This quantity of vaccine is the largest issue so far recorded in the laboratory and represents an increase of nearly 33 per cent. on last year's demand.

Only one case of pleuro-pneumonia came under notice this year among cattle awaiting export to Egypt.

Foot-and-Mouth Disease.

Towards the end of the year foot-and-mouth disease appeared in the Fung and Blue Nile Provinces and spread to Khartoum Province. The possibility of tracing the origin of outbreaks of this disease, or of controlling its spread, is rendered extremely remote by its mild nature which leads native cattle owners to regard its presence in their herds as of little or no importance. The outbreak in Khartoum Province involved the Belgravia Dairy herd and it was feared that the consequence might be serious since this herd is mainly composed of half-bred Friesians and Shorthorns. This fear proved, however, to be groundless as the disease pursued the same mild course in the dairy herd as it does in cattle of purely native blood.

By the end of the year the disease had almost died out in the three Provinces mentioned.

Unfortunately, before the presence of the disease was discovered in Khartoum, a consignment of apparently healthy but infected cattle was despatched to Egypt and resulted in some interference with trade.

Trypanosomiasis.

Fourteen cases of trypanosomiasis (T.congolense) were diagnosed at the Veterinary Laboratory in blood smears taken from cattle during the year. Two of these cases occurred in the Nuba Mountains, two in the Fung Province and the remainder in Upper Nile Province. Other cases of this infection were diagnosed in the serum laboratory at Malakal and the Veterinary Research Officer makes the following comments :-

"The tse-tse areas of the Southern Sudan are as yet
"largely undetermined, but with the increase of veterinary
"activity in Upper Nile Province that province is being
"found to sustain a fairly heavy infection with tse-tse borne
"trypanosomes. Positive cases have been detected in Fangak,
"Duk Faiwil and Akobo, while those detected in the serum
"laboratory have been among cattle originating in Nasir.

"It is probable that the ultimate source of all tse-tse borne trypanosomiasis in Upper Nile Province is the rising ground along the Sudan-Abyssinian boundary, since the remainder of the province is a low swampy plain hardly suited to the multiplication of the flies."

As a result of observations carried out by the Senior Veterinary Inspector, Kordofan Province, it would appear that trypanosomiasis due to T.congolense infection is prevalent among the cattle of the Humr tribe and occasionally causes heavy losses. The disease is termed "Abu Fasukh" by the natives and the prominent symptoms are emaciation, anaemia and pica. It is probable that infection mainly occurs when the Humr herds are grazing along the Bahr El Arab.

Tuberculosis.

Pulmonary tuberculosis in a bull was diagnosed at the Veterinary Laboratory in material forwarded from Bahr el Ghazal Province. Cases of bovine tuberculosis come to notice but rarely and, as the Veterinary Research Officer points out, in consideration of the number of cattle slaughtered in controlled centres for food, and of the fact that several hundred cattle yearly are examined post-mortem in the veterinary laboratories at Khartoum and Malakal, the disease must be very uncommon.

Anthrax.

The only outbreak of anthrax which came under notice during the year occurred in Singa township, the Fung Province, in December when two cattle died of the disease.

II. DISEASES OF CAMELS.

Owing to reduction of establishment the number of camels for which forage allowance was drawn was reduced by 70 and, at the end of the year, the actual strength was 1,077. Losses from all causes among these animals amounted to 230 this year and, after due allowance has been made for the reduction of establishment effected during the year, these losses compare favourably with those of 1930 and 1931 when the totals were 394 and 314 respectively.

The practical value of the present methods of diagnosing and curing trypanosomiasis is well illustrated by the fact that, since their adoption, the losses reported from trypanosomiasis in camels in Government service have fallen from an average of 40 per cent. to less than 8 per cent. of the losses from all causes.

Uniformly good results have followed the administration of the reduced dose of 4 grammes of Naganol per camel and a considerable saving in the cost of treatment has thereby been effected. This reduction in cost has encouraged many of the camel-owning tribes to avail themselves more freely of the treatment and large numbers of native-owned camels have been presented for injection during the past few months.

Some interesting and valuable observations on the prophylactic properties of Naganol were carried out recently by the Veterinary Research Officer and the details are given in his report.

A serious outbreak of mange occurred among police camels at Nahud during the rains, and the native herds in Eastern Kordofan, El Obeid and the Fung Province were reported to be badly affected at the same time.

Several cases of contagious necrosis occurred among Government camels in Kordofan during the rains.

III. DISEASES OF EQUINES.

African Horse Sickness.

This disease was more prevalent than usual in Blue Nile Province and was responsible for the deaths of 20 horses in the irrigated area. The mortality was confined entirely to imported horses most of which were valuable animals.

In Kordofan Province cases of horse sickness occurred in El Obeid, Dilling, Kadugli and near Bara, and No. 3 Company of the Camel Corps lost 1 horse and 13 mules.

Losses from this disease elsewhere were not abnormal.

The returns of casualties caused by horse sickness among the horses and mules in Government service (excluding Army animals) for the past four years were as follows :-

YEAR	HORSES	MULES	TOTAL
1929	27	44	71
1930	14	11	25
1931	13	29	42
1932	11	7	18

Epizootic Lymphangitis.

Epizootic Lymphangitis was diagnosed at the Veterinary Laboratory from material forwarded during the year from 24 horses, 40 mules and 6 donkeys. The total of 70 cases compares favourably with a total of 80 last year, the improvement being due to a decrease in the number of infected animals reported in Upper Nile Province. Of the cases recorded this year 40 occurred in Upper Nile Province, 13 in the Fung Province and 10 in Kordofan Province. The cases reported in Kordofan Province during the past two years all originated in the Nuba Mountains area.

Details of two pulmonary infections which came under notice are given in the appended report of the Veterinary Research Officer which also contains the conclusions arrived at as a result of experiments conducted to estimate the value of mercuric and potassium iodides in curing epizootic lymphangitis.

Globidium Infections.

Opportunities presented themselves during the year for carrying out further studies of globidium infections in horses at the Laboratory. The condition may readily be mistaken for ringworm and, from the information supplied by the Hawazma Arabs of Rashad District, it is held responsible for the very heavy losses they suffered a few years ago.

Other Diseases.

Two cases of ulcerative cellulitis were diagnosed at the Laboratory, one in Kordofan Province and one at Malakal, and a fatal case of tetanus in a foal was reported in Blue Nile Province.

Cases of trypanosomiasis, due to T. brucei and T. congolense infection, came under notice in 2 horses and 3 donkeys.

IV. DISEASES OF SHEEP AND GOATS.

With the exception of a few outbreaks of contagious caprine pleuro-pneumonia, no notable mortality from infectious or contagious diseases was recorded among sheep or goats during the year. Cases of trypanosomiasis in sheep, due to T. congolense infection, were reported in Akobo district, Upper Nile Province.

V. DISEASES OF DOGS.

Rabies was definitely diagnosed in dogs at the Wellcome Tropical Research Laboratory from material forwarded for examination from the following provinces :-

Blue Nile	.....	1 case in February at Hag Abdulla, 2 cases in June and 2 cases in July in Wad Medani district.
Kassala	.....	1 case in February and 1 case in June, both in Sinkat district.
Kordofan	.....	1 case in February at Dilling and 1 case in September at Nahud.
Berber	.....	1 case in April, Atbara District.
White Nile	.....	1 case in June and 1 case in July, both at Tendelti.

In addition to the foregoing the disease was definitely diagnosed in dogs from material forwarded from Port Sudan in March and again in May. Suspected cases of rabies were reported from Darfur Province in February, March and September so that the disease was widespread during the year.

In dealing with the outbreak in Berber Province an order was issued to shoot all dogs in the Province : In Blue Nile Province all British-owned dogs were either destroyed or placed in quarantine for 3 months and, by the end of the year, both these provinces were considered to be free of the disease. In other areas the destruction of all ownerless and stray dogs continues to be carried out as far as circumstances will permit.

S E C T I O N I I .TRADE IN LIVESTOCK AND LIVESTOCK PRODUCTS.I. EXPORT AND IMPORT TRADE.Cattle and Sheep.

There was no demand in Egypt for our cattle and sheep during the first eight months of the year and local prices fell to extremely low levels. Prospects of trade brightened somewhat in August when a substantial reduction of the freights for cattle and sheep on the Sudan railways and steamers was made and, with the despatch of a few train loads of cattle to Egypt in September and October, prices showed a small but definite upward trend which was fairly well maintained until the end of the year. The decrease in the number of cattle exported this year as compared with last year was, to some extent, offset by a considerable increase in the number of sheep exported.

The appearance of foot-and-mouth disease in one consignment of cattle forwarded to Egypt in November resulted in some interference with trade but, fortunately, the disease was confined to areas from which few cattle are drawn normally for export.

Further details of the trade in cattle and sheep are given in the following tabulated statements :-

A. Numbers and values of cattle and sheep exported during the last four years.

Year	Cattle	Sheep	Valuation at port of export
1929	10,412	15,079	LE. 84,045
1930	9,520	5,702	" 60,041
1931	5,347	919	" 23,245
1932	3,470	4,229	" 14,763

B. Numbers of cattle imported during the last four years :-

Year	French Equatorial Africa	Eritrea	Abyssinia	Total
1929	2,834	290	1,743	4,867
1930	3,170	8	1,605	4,783
1931	65	16	839	920
1932	113	36	301	450

C. Origin of cattle exported during the last three years :-

Province	1930	1931	1932
Darfur and Kordofan	6,465	4,624	3,255
White Nile	355	88	100
Upper Nile	453	299	20
Bahr el Ghazal.....	305	230	20
Khartoum	302	101	75
Berber	1,640	-	-
Kassala	-	5	-

D. Average market prices and total numbers of cattle sold for export in El Obeid market during the last four years:-

Year	Number of cattle sold	Average price <u>LE.Mms</u>
1929	7,675	3.355
1930	5,780	3.033
1931	2,126	2.210
1932	2,435	1.405

In the second part, the focus shifts to the analysis of the recorded data. This involves comparing the actual results against the budgeted figures and identifying areas where variances have occurred. The document provides a detailed breakdown of these variances, explaining the reasons behind them and suggesting corrective actions to be taken for future periods.

The final part of the document summarizes the key findings and conclusions drawn from the analysis. It highlights the overall performance of the organization and provides recommendations for improving efficiency and controlling costs. The document concludes by stating that the information presented is intended to provide a clear and concise overview of the financial situation and to serve as a basis for informed decision-making.

Camels.

Few camels were exported to Egypt before the rains but in the latter half of the year there was a fair demand for fat camels in Kassala Province and prices were better than in 1931. Two Egyptian merchants commenced buying in Khashm el Girba in October and ultimately purchased about 600 head which they exported to Egypt. At the end of the year it was reported that merchants were purchasing camels on a large scale in Western Kordofan. Permits for the export of the following numbers of camels were issued in the Provinces shown during the year :-

Kassala Province	7,964	Head
Khartoum Province	<u>1,081</u>	"
TOTAL	9,045	

Mules.

Only eight mules were imported from Abyssinia during the year.

Hides and Skins.

The trade in hides and skins was very poor throughout the year and, for some months, large quantities lay unsold in the market at Omdurman as a result of the demand from abroad having practically ceased. In consequence of the lack of demand "Fashoda" hides were at one time quoted at £E.10 per ton. Values of hides have now fallen to such an extent that the cost of transport excludes from the markets practically all hides except those produced on the railway or on the river. The possibility of improving the quality of these products is, therefore, not very great and will be limited to a very narrow field until such time as the demand increases and prices improve.

The quantities of hides and skins exported during the last five years were as follows :-

Y e a r	Hides	Skins
	Tons	Tons
1928	2,309	880
1929	1,328	1,014
1930	1,049	950
1931	818½	899½
1932	712	862

The average values of these exports, calculated from the figures shown in the Customs Returns, were as follows :-

Y e a r	Hides Average price per ton	Skins Average price per ton
1928	£E.93.5	£E.93.9
1929	60.9	103.5
1930	38.7	103.4
1931	23.8	65.1
1932	16.3	45.4

Of the hides exported during the year 241 tons were shipped to Great Britain and a total of 410 tons to Syria, Italy, Turkey, Germany and Greece. 80 per cent. of the skins exported were shipped to the United States of America.

The following information in regard to the classification of 88,292 hides exported during the year has been very kindly supplied by the merchants who handled the consignments :-

Classification of hides	Number of hides	Total weight Kilos	Average weight Kilos
Fashoda	84,812	474,965	5.6
Dry Salted.....	4,110	45,644	11.1

Samn or Maslee (Clarified Butter).

During the year 117 tons of samn were despatched by rail or steamer from White Nile Province and 460 tons were railed from El Obeid to various local markets. As in the case of most other commodities the market value of samn continued to fall during the year, the average price at Kosti dropping from £E.55 per ton to £E.41 per ton.

The exports and imports of samn during the last three years were as follows :-

		" 1 9 3 0 "		" 1 9 3 1 "		" 1 9 3 2 "	
		" Tons "	Value	" Tons "	Value	" Tons "	Value
		"	L. E.	"	L. E.	"	L. E.
Exports	.....	" 284 "	22,316	" 244½ "	16,614	" 367 "	21,607
Imports	.....	" 25 "	1,858	" 28 "	1,865	" 14½ "	887

II. INTERNAL TRADE.

The numbers of animals slaughtered for food in ten of the larger towns during the past three years were as follows:—

		1930	1931	1932
Cattle	.....	22,230	17,927	15,773
Sheep	.....	159,350	156,303	155,483
Goats	.....	10,956	7,395	3,609
Camels	.....	2,756	2,408	2,725

The demand for cattle and sheep for local slaughter was poor throughout the year but the drop in prices was not so marked as in the case of animals suitable for export.

In comparison with previous years the returns of animals slaughtered for food in Blue Nile Province show decreases in the numbers of cattle and sheep utilized. These are offset, to some extent, by increases in the numbers of camels and goats, an indication of the decreased purchasing power of the natives in the irrigated area.

S E C T I O N III.IMPROVEMENT OF LIVESTOCK.
-----Cattle.

The efforts of the veterinary staff during recent years to persuade the cattle owning tribes to eliminate "scrub" bulls from their herds by castration, and to exercise greater care in the selection of their stud bulls, are beginning to bear fruit. Castration effected by means of Eschini's forceps has become extremely popular in Southern Kordofan and Southern Darfur and many of the tribal veterinary retainers have recently been trained in the use of this instrument. One retainer alone in Kordofan Province operated on over 2,000 bulls in the course of the year. If progress along these lines continues a marked and lasting improvement of the breed of cattle will, in time, be effected. Sudan beef is regarded in Egypt as of poor quality on account of its dark colour. This is due to the fact that, in the past, the animals exported to Egypt have been either mature bulls, or bullocks which were castrated late in life. The castration of young bulls which is gradually becoming a general practice should, therefore, result in an improvement in the quality of the beef.

The Belgravia Dairy herd was disposed of during the year and is now maintained by an enterprising local farmer for the supply of dairy produce to Khartoum. A pure bred Jersey bull imported from Egypt has recently been added to this herd and the results will be watched with interest.

Horses.

Early in the year it was decided, on account of financial stringency, to reduce the annual expenditure on horse improvement by 50 per cent. and the necessary reduction was effected by the end of April. This naturally resulted in a severe curtailment of the horse-breeding scheme initiated seven years ago and was a sad blow to all those who are keenly interested in the improvement of the local breed of horse.

In Kordofan Province the benefit of the introduction of Syrian and Arab blood is gradually becoming apparent in the improved quality of many of the animals offered for sale at the local horse fairs. It has long been evident that, if success is to attend the introduction of sires of improved blood, it is essential that their progeny be reared under better conditions, as regards food and general care, than the native horse has hitherto been accustomed to, but considerable difficulty is being experienced in convincing the horse-owning tribes of this necessity, particularly at times when grain is dear.

Keen interest in horse improvement continues to be displayed by breeders in the Khartoum and Shendi districts and there was a good demand during the year for the services of the Government sires stationed in these areas.

Captain R.S. Audas, M.C., J.N., Veterinary Inspector, Darfur Province, reports as follows on horse breeding in Southern Darfur :-

"The conditions of adversity experienced during the past two years throughout the breeding areas ended with the beginning of the rains and now there is grass and grain in plenty. The horses produced at the two southern shows were in surprisingly good condition. There is no doubt that, although not noticeable at the shows except in the lack of numbers, the inevitable aftermath of the adverse conditions recently experienced, namely, the poor condition of the breeding stock, abortions, deaths and the retarded growth of the young stock, will be reflected in the reduced number of good horses, both native and stud-bred, obtainable during the next two or three years. The fact that the horse-breeding scheme has successfully weathered this long period of depression and food scarcity is in itself very encouraging.

found "It was most unfortunate that, owing to financial stress, it was ~~necessary~~ necessary to make a cut of 50 per cent. in the sum allotted for the upkeep of sires. This cut was made immediately after the tribal gatherings had been held and called for the exercise of considerable ingenuity to give effect to it with a minimum loss of efficiency. A few stallions were disposed of to headmen and a certain number were farmed out to natives of standing. Owing mainly to adverse conditions this system was not satisfactory and many of the horses were found recently to be in very poor condition and unfit for service,

"Experience during the past six years proves that stallions kept under Government supervision get a much higher percentage of foals than those left in charge of a native.

"Two stallions, "Asad Karim" and "Fiki", died during the year leaving 19 Government stallions in the Province.

"We shall be short of sires in the near future and it would be nothing short of a calamity if funds cannot be found to maintain the scheme at its present level".

Poultry.

Pens of Aylesbury ducks and White Leghorn fowls were imported by private individuals during the year.

The Veterinary Inspector, Darfur Province, reports that many hundreds of eggs for hatching were distributed, and that El Fasher town is now well stocked with pure and three-quarter-bred fowls mainly of the Leghorn breed.

In all the larger towns in Kordofan Province, Leghorn and Wyandotte strains are now well established.

S E C T I O N I V .

M I S C E L L A N E O U S .

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GRAZING AND WATER.

There was a shortage of grass in southern Sudan during the first half of the year but conditions in regard to grazing and water rapidly improved after the rains and, during the last five months, were generally satisfactory throughout the country. With the exception of a few of the southern districts where the grazing areas were attacked by locusts, the damage caused by these insects was almost negligible compared with the last two years. Grazing was reported to be particularly scarce after the rains in most of the northern half of the Fung Province and this was attributed to locusts having eaten off the grasses last year before they had seeded. Towards the end of the year grazing was stated to be very scanty in the Southern district of White Nile Province.

LIVESTOCK SHOWS.

The Shendi horse show, which looks like becoming an annual event, was held at the end of February and attracted 300 entries, an increase of 52 over last year. As in the case of last year's show the success attending it was largely due to the keen interest taken by the Officer Commanding and the Officers of the Cavalry and Mounted Rifles.

The usual tribal gatherings and horse fairs were held in the various provinces during the year and proved of considerable value to the Government in establishing closer contact with the tribes concerned.

PURCHASE OF REMOUNTS.

140 camel remounts were purchased in Kassala Province and 342 horse remounts were purchased in Darfur Province for the Sudan Defence Force during the year.

The castration of Army camels in Kordofan has given most satisfactory results and all remounts for the Camel Corps are now castrated before being posted to units.

During the year 60 horses were purchased in Kordofan for police and other Government Services.

BELGRAVIA DAIRY.

As previously mentioned in this report the Belgravia Dairy was disposed of during the year and is now run as a private enterprise.

VETERINARY HOSPITALS.

The number of animals which received treatment at the Veterinary Hospitals in Khartoum and Wad Medani during the year were as follows :-

Khartoum	.....	2,971
Wad Medani	.....	<u>3,829</u>
		6,800
		=====

The total number of patients treated in these hospitals last year was 9,115.

The returns of the shoeing forge attached to the Khartoum Civil Veterinary Hospital show that 752 horses and mules were shod and 270 horses and mules had their feet rasped and trimmed. The large decreases registered in the numbers of horses and mules shod etc. during the past two years are probably mainly due to the displacement of horse-drawn vehicles by motors.

ACKNOWLEDGMENTS.

The reduction of Veterinary Staff which it was found necessary to effect during the period under review made conditions much more difficult than usual, and this opportunity is gladly taken to express my appreciation of the admirable

manner in which all members of my staff discharged the various duties, both Civil and Military, demanded of them.

It is also a pleasure to acknowledge the assistance, at all times so freely given to me and my staff, by all other Departments and Services.

(Signed) W. Kennedy

Sadik.

DIRECTOR, SUDAN VETERINARY SERVICE.

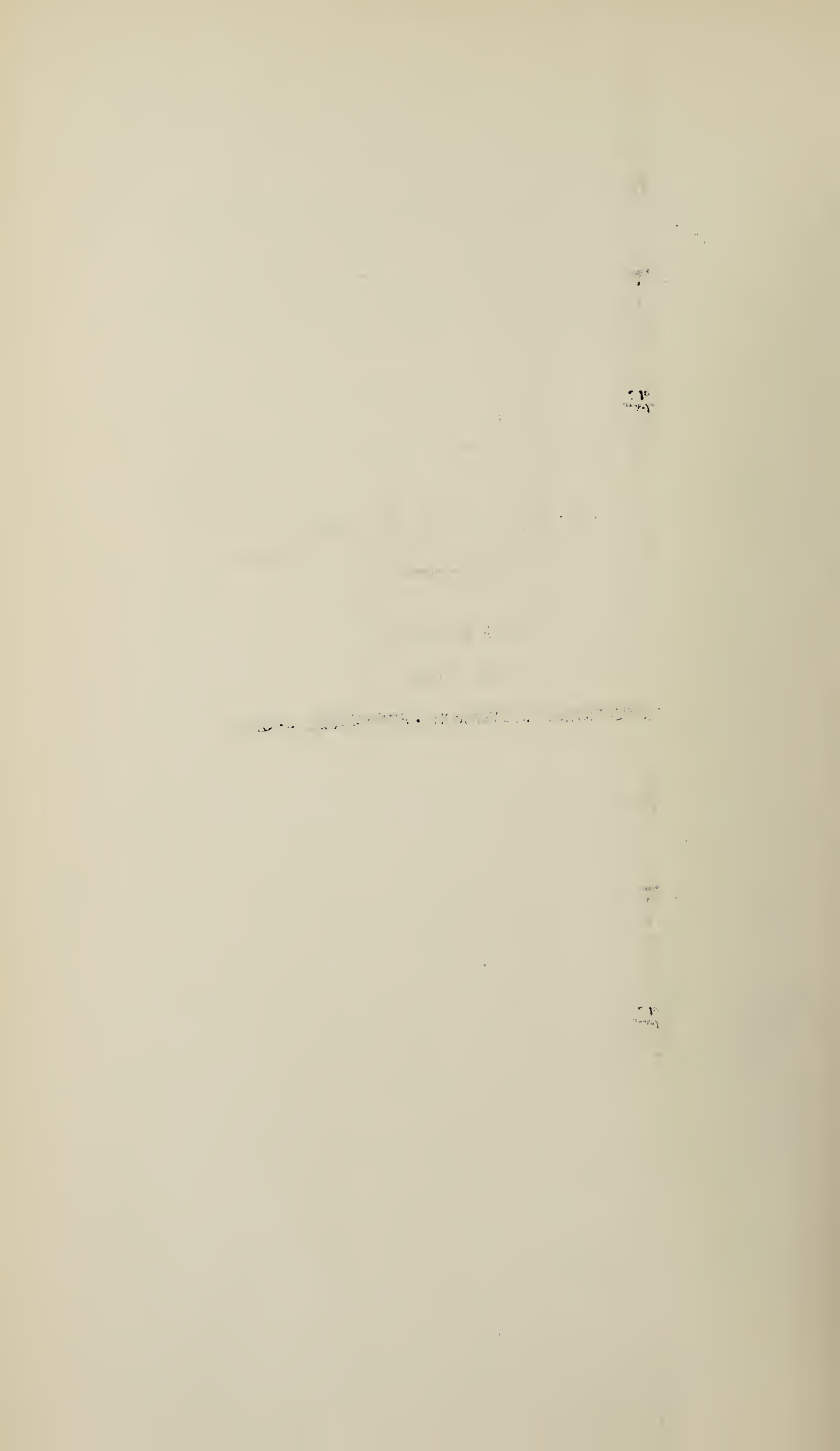
A P P E N D I X

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R E P O R T

of the

VETERINARY RESEARCH OFFICER, S.G.



A N N U A L R E P O R T

of the

VETERINARY RESEARCH OFFICER,

Sudan Government.

1 9 3 2.

A. S T A F F.
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The classified staff throughout the year has consisted of myself, one Assistant Veterinary Research Officer, one Laboratory Assistant and one Sudanese clerk.

The Assistant Veterinary Research Officer (Mr. J.T.R. Evans, B.Sc.), having been permanently posted to the Serum Laboratory at Malakal, has not been available for any duties in Khartoum. During my leave therefore, from mid-July to mid-October, the laboratory was in charge of the Laboratory Assistant (Mr. P.A.C. Kenny), while during his period of leave, from mid-April to mid-July, I was without an assistant. Throughout the second half of the year the clerk has been either partially or totally incapacitated on account of sickness for considerable periods. The responsibility thrown on the Laboratory Assistant in this as in several earlier years is particularly to be noted.

B. R O U T I N E W O R K.
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The routine work of the laboratory has mainly consisted of the following duties :- Preparation of cattle plague antiserum, preparation of bovine pleuro-pneumonia vaccine, issue of diagnostic materials and Naganol for the control of camel trypanosomiasis, examination and reporting on material submitted for diagnosis, and maintenance of the Veterinary Service library.

I. EXAMINATION OF SPECIMENS.

The amount of material submitted for diagnosis has been gradually decreasing for some years. As recorded in earlier reports, this decrease is partly referable to the relegation of the routine diagnosis of camel trypanosomiasis to field officers. During 1932, however, the number of specimens submitted was approximately the same as in 1931 (actually 40 less).

A total of 423 specimens has been received, this number being exclusive of examinations made in connection with research or other duties within the laboratory. The diagnoses have been as follows :-

HORSES.

Epizootic Lymphangitis	23	
Cryptococcus pneumonia	1	
Ulcerative cellulitis	1	
Common pyogenic infections	12	
Trypanosoma brucei	1	
Trypanosoma congolense	1	
Piroplasma caballi	1	
Nuttallia equi	1	
Filaria (in blood)	1	
Ringworm	3	
Cutaneous habronemiasis	1	
Horse Sickness	1	
Sarcoma	1	
Globidium infection	2	
Negative	<u>76</u>	126

MULES.

Epizootic Lymphangitis	39	
Cryptococcus pneumonia	1	
Ulcerative cellulitis	1	
Streptococcus pneumonia	1	
Catarrhal pneumonia, cause undetermined	1	
Common pyogenic infections	12	
Filaria (in blood)	1	
Cutaneous habronemiasis	1	
Sarcoma	1	
Negative	<u>45</u>	103

DONKEYS.

Epizootic lymphangitis	6	
Common pyogenic infections	1	
Streptococcus pneumonia	1	
Catarrhal pneumonia, cause undetermined	1	
Trypanosoma congolense	3	
Negative	<u>12</u>	24

CATTLE.

Trypanosoma congolense	14	
Trypanosoma theileri	1	
Theileriasis (? T.annulatum)	4	
Anaplasmosis	2	
Anthrax	2	
Actinomyces farcinicus	2	
Tuberculosis	1	
Common pyogenic infection	1	
Negative	<u>36</u>	63

CAMELS.

Trypanosoma soudanense	6	
Pneumonia, various types	4	
Echinococcus cysts in lungs	2	
Common pyogenic infections	4	
Necrosis of liver	1	
Negative	<u>26</u>	43

DOGS.

Piroplasma canis	1	
Negative	<u>16</u>	17

SHEEP.

Catarrhal pneumonia	1	
Negative	<u>3</u>	4

FOWLS.

Spirochaetosis	4	
Negative	<u>26</u>	30

MISCELLANEOUS NEGATIVE	<u>13</u>	<u>13</u>
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Total..... 423

II. NOTES ON SPECIMENS EXAMINED.

It must first of all be noted that the record of specimens examined is not to be taken as closely representative of the incidence or proportional distribution of the conditions in which a diagnosis has been established. Most diagnosis is effected locally by the Veterinary Inspectors of Provinces, and with the exception of epizootic lymphangitis and anthrax, from which material is always sent to the laboratory for confirmation of diagnosis, the specimens are submitted either on account of especial interest, or much more commonly merely in order to obtain the opinion of the laboratory on the particular specimen. Specimens worthy of more than mere record have been as follows :-

(i) Epizootic lymphangitis.

This disease, if one includes pulmonary cryptococcus infection, has again provided items of interest. The two cases of cryptococcus pneumonia recorded in the list of diagnoses are worthy of detailed reports.

Case No.1. Pony aged 6 years. Diagnosed by Veterinary Inspector, Upper Nile Province (Mr. W.H. Glanville), further observations and post-mortem examination carried out by Mr. Evans. In November 1931

the horse was inspected, and found in good condition and healthy. In December 1931 a cough developed, some nasal discharge appeared, and loss of condition was evident. Microscopic examination of nasal discharge was negative. A month later condition was worse, with cough and nasal discharge persisting; microscopic examination of the latter was still negative. In March and April 1932 the condition grew much worse; respirations became accelerated shallow and abdominal, short intermittent attacks of mild fever were recorded, and extensive areas of consolidation were established in both lungs. The horse was destroyed in April 1932 (about four months after the first appearance of symptoms), although it might probably have remained alive for some weeks longer. No superficial lesions of any kind had been found throughout the illness, and appetite had always been good.

Post-mortem examination revealed all organs and tissues normal except the lungs, bronchial glands and lower extremity of the trachea. The surface of both lungs showed a large number of hard raised areas of variable size but with a maximum diameter of about four centimetres. Incision of the pulmonary substance revealed a crowded mass of such separate nodules, distributed mainly in the anterior portions, but extending in smaller numbers posteriorly. Although dense in consistency, pus was present in the centres of the nodules, and this was swarming with cryptococci. There was no sign of pulmonary congestion, and no pleurisy. The bronchial glands were enlarged but otherwise normal in appearance, but smears from their interior revealed a few cryptococci. (This observation was confirmed on examination of preserved gland material in Khartoum; cryptococci were very sparsely distributed, a few being free in the lymph spaces but most of them enclosed in mononuclear leucocytes). There were a few submucous nodules at the lower end of the trachea.

Case No.2. Abyssinian mule aged 8 years. Observed throughout by Mr. Glanville in Upper Nile Province. In December 1931 the mule was submitted to veterinary inspection and was in "very fair" condition and apparently healthy. In January 1932 a slight cough was present for a period of four days, but subsequently ceased. Submitted to veterinary inspection in April, the mule appeared healthy but condition was recorded as only "fair". In May a cutaneous lesion suspicious of epizootic lymphangitis appeared, accompanied almost simultaneously by a cough which lasted nine days. In June veterinary inspection was again carried out. There was then no cough or other sign of lung trouble, but cryptococci were found in the cutaneous lesion and the mule was destroyed. There had never been any nasal discharge or fever, and the mule had always fed well; it was not, therefore, imminently threatened with death, but pulmonary symptoms had been present, although intermittently, for probably five or six months.

On post-mortem examination the lungs only were abnormal. Four circumscribed lesions were found, two in each lung, the largest being about 15 cm. in diameter and the smallest about 6-7 cm. The lesions consisted in all cases of a greatly thickened outer zone or "wall" with a central zone of very thick pus (The largest lesion whose volume was about 1500 c.c. was estimated to contain about 250 - 300 c.c. of thick pus). Large numbers of cryptococci were present in the pus. The lung tissue apart from the lesions was quite normal, as were the bronchi, bronchial glands and trachea.

These two cases are interesting in the general sense in that they confirm one's earlier conclusion that distributionally the condition is characterised by great variability; lesions may be large or small, few or many, circumscribed or diffuse. The first case of the foregoing pair presents many small circumscribed lesions, while the second one shows a few large circumscribed ones. The first case is of further interest in that it constitutes the first occasion on which definite infection of the bronchial glands has been established. This observation cannot be considered as remarkable; it is indeed more remarkable on general pathological grounds that gland infection has not been established in any of the earlier cases.

Regarding the commoner superficial form of epizootic lymphangitis there is little of interest to record. Of the 68 positive cases the majority were detected in Upper Nile (38), Fung (13) and Kordofan (10) Provinces; all of the Kordofan cases originated in the Nuba Mountains.

(ii) Trypanosomiasis.

Camel trypanosomiasis, being now entirely diagnosed in the field, may be left out of discussion.

In the case of the tse-tse borne trypanosomes no new information can be placed on record, since all cases have originated in well known tse-tse districts. Southern Kordofan provided one T. brucei infection in a horse and six T. congolense cases (horse 1, donkeys 3, cattle 2). Fung provided two T. congolense cases in cattle while the Upper Nile provided ten. A single T. theileri infection in a bull was found in Khartoum. In addition to the specimens recorded above many cases of T. congolense infection have been diagnosed in the serum laboratory at Malakal. The tse-tse areas of the Southern Sudan are as yet largely undetermined, but with the increase of veterinary activity in the Upper Nile Province that province is being found to sustain a fairly heavy infection with tse-tse borne trypanosomes. Positive cases have been detected in Fangak, Duk Faiwil and Akobo, while those detected in the serum laboratory have been among cattle originating in Nasir. It is probable that the ultimate source of

all tse-tse borne trypanosomiasis in the Upper Nile Province is the rising ground along the Sudan-Abyssinia boundary, since the remainder of the province is a low swampy plain hardly suited to multiplication of the flies.

(iii) Anthrax.

Both the cases in cattle occurred (simultaneously) in Singa town. This record is in keeping with the observations of earlier years that small outbreaks, involving very few animals, occasionally come to notice in various parts of the country.

(iv) Tuberculosis.

The remark regarding anthrax would be equally, or even more, applicable to tuberculosis. Rare cases come to notice, but in consideration of the number of cattle slaughtered in controlled centres for food, and of the fact that several hundred cattle yearly are examined post-mortem in the veterinary laboratories at Khartoum and Malakal, the disease must be very uncommon. The single case diagnosed this year was of pulmonary infection in a bull in the Bahr-el-Ghazal Province.

(v) Globidium infections.

Two further cases of this peculiar infection have come to the notice of the laboratory, thus providing additional material for studies that have been in hand, although intermittently, since 1926. Both cases were in horses and originated in Southern Kordofan, where in collaboration with the Senior Veterinary Inspector of the province (Captain H.B. Williams, O.B.E.) an attempt is being made to assess the economic significance of the infection. Veterinary control of Southern Kordofan has until recently been confined almost entirely, as regards equine practice at any rate, to officially owned animals, but it now seems that this disease is well known to horse owning tribes, and that in recent years considerable losses from it have been experienced. Observations carried out in the laboratory will be treated in the section of this report dealing with research.

III. CONTROL OF CAMEL TRYPANOSOMIASIS.

In last year's report an account was given of the treatment of camel trypanosomiasis by the intravenous injection of a single dose of four grammes of Naganol. In every case, all of which were kept under observation after treatment, a cure appeared to have been effected, and it was decided that for at least a year a single dose of four grammes should be adopted as the universal routine treatment. About 1,000 infected camels have now been so treated and no case of failure to cure has been brought to notice.

Certain experimental work has been carried out, and this will be recorded in the section dealing with research.

IV. CATTLE PLAGUE ANTISERUM PRODUCTION.

During 1932 an attempt was made to raise the net output of the Malakal laboratory from 3,000 litres to 5,000 litres. Buildings sufficient for accommodation in preparing 3,000 litres were already (with the exception of a few minor items) complete, and it was decided not to demand any additions until experience had shown them to be necessary.

The supply of cattle was on the whole satisfactory although, as a result of widespread cattle plague in the surrounding districts during the preceding year, about 25 per cent. of prospective virus producers proved immune. Fortunately the combined persuasion of the local veterinary and administrative staffs convinced the native cattle owners that it was to their advantage to accept these immune cattle in exchange for potentially susceptible ones. The exchanges involved delay but they completely eliminated the additional expense that would otherwise have been incurred. Although this procedure was fairly successful during the past year, it is to be hoped that it will only have to be adopted occasionally, and on a limited scale. It is troublesome not only to oneself but also to the Province staff, at best it entails some delay, and if it has to be practised extensively or during a climatically bad season it may materially diminish the output of serum.

Grazing was adequate, although not plentiful, and the serum producing cattle remained in fairly good condition.

Ultimately a little over 4,700 litres of serum was prepared (94,000 odd nominal "doses" of 50 c.c.), which has been sufficient to supply all demands from the field. This output represents an increase of about 29 per cent. over that of last year. Three potency tests were carried out, and the serum proved of a quality that showed considerable protective power at a dosage of 5 c.c. per 100 lb. body weight and protection from anything but mild fever at a dosage of 10 c.c. per 100 lb. In fact the serum was of high potency.

A certain amount of experimental work was also carried out at Malakal, and this will be mentioned in the section on research.

V. CONTAGIOUS BOVINE PLEURO-PNEUMONIA.

The demands for pleuro-pneumonia vaccine conform to those for Naganol and cattle plague antiserum in being the highest yet recorded in the laboratory. 31,200 doses were issued, as compared with 23,580 in 1931. No further experimental work has been carried out on this vaccine and the technique of production was exactly as in the two preceding years.

VI. LIBRARY.

The only point of interest in connection with the library is that, small though it yet is, it has outgrown its accommodation. Owing to the small size and overcrowded state of the laboratory the library has hitherto occupied "spare" space in two non-adjacent small rooms which are used for other purposes. Such an arrangement has always been inconvenient, but with the complete filling up of all available space the inconvenience is being aggravated.

C. R E S E A R C H.

The permanent posting of the Assistant Veterinary Research Officer to Malakal, and the slight, but nevertheless definite, increase in routine work in Khartoum, have kept the research programme within very rigid bounds. Work has been carried out on camel trypanosomiasis, cattle plague, epizootic lymphangitis, and globidium infections, the following being a summary of observations in so far as they have reached a stage worthy of report.

I. CAMEL TRYPANOSOMIASIS.

Field observations confirming the curative efficacy of a single intravenous dose of four grammes of Naganol have already received notice. The deliberate research carried out in the laboratory has been concerned with the prophylactic properties of this drug.

The question of "immunity" in camels cured of trypanosomiasis with Naganol received attention in 1928 (see this Report for that year). It was there shown that in camels cured with a single intravenous dose of ten grammes a refractory period of probably more than four months but certainly less than eight months ensued. Field observations over a period of four years have confirmed this conclusion, but it has never been certain whether the refractory period has been referable to a true immunity - in the immunological sense - or to the protective influence of residual traces of Naganol. From both academic and practical standpoints the problem demanded solution, and laboratory experiments on a preliminary scale afforded it.

THE EXPERIMENT (commenced 1.11.31). Twelve camels giving negative reactions to the mercuric chloride test were purchased. Blood samples were inoculated into gerbils, which remained healthy. Three weeks later the negative reaction was checked, six were given four grammes of Naganol and the other six were given ten grammes. The further programme was to inject two of each group with virulent blood (plus controls) at intervals of two, four and six months. Before each test, the camels concerned were to be checked as to freedom from infection by application of the mercuric chloride test and by gerbil inoculation. After injecting virulent blood they were to have their blood examined daily, the mercuric chloride test applied weekly, and any camel remaining negative in both cases for a period of two months was to have samples of its blood injected into gerbils.

(i). Test two months after giving Naganol.

Two camels having received ten grammes, two having received four grammes, and a control, all confirmed free from trypanosomes, were given infected blood. Both ten gramme camels resisted infection; their blood remained free from trypanosomes, their mercuric chloride reactions remained negative, and gerbils injected two months later with their blood remained healthy. Of the four gramme camels, one resisted infection according to the standards just described, but the other developed a positive mercuric chloride reaction, trypanosomes appeared and persisted in the blood, and the camel progressively lost condition until it had to be treated. The control became similarly infected.

(ii). Test four months after giving Naganol.

Two ten gramme camels, two four gramme camels, and a control were checked for freedom from infection and given virulent blood as above. Both ten gramme camels withstood infection according to the standards already described, one of the four gramme camels resisted infection but the other did not, and had to be treated. The control became infected in the usual way.

(iii). Test six months after giving Naganol.

One of the remaining four gramme camels had died of intercurrent disease, but this was of little account, since the efficacy - or rather the lack of it - of four grammes of Naganol had already been determined. Two ten gramme camels, one four gramme camel and a control were thus checked and given virulent blood in the usual way. All five developed trypanosomiasis with positive mercuric chloride reactions, trypanosomes in the peripheral blood, and loss of condition to a degree that made treatment necessary.

The results of this experiment, small though it was, are so definite as to require little comment. Four grammes of Naganol cannot be relied upon to protect a camel even for two months, while ten grammes may protect for four months but not much longer. A more precise conclusion cannot be drawn in the absence of large scale observations, and these do not appear to be indicated.

In consideration of the rate of incidence of camel trypanosomiasis in the Sudan, and of the ease with which it is now controlled by early diagnosis and treatment, the prophylactic administration of Naganol is in general contra-indicated. There are, however, circumstances in which it might occasionally be so employed.

It is interesting to consider the foregoing experimental results together with those obtained when studying "immunity" following cure with Naganol, (see this Report for 1928). It then becomes evident that after the receipt of a ten gramme dose, a camel is probably resistant to infection for four months regardless of whether it was infected or healthy at the time of receiving the drug; in fact for practical purposes immunity in the true sense does not exist. (It may be mentioned that circumstances can be and have been arranged to demonstrate that true immunity may to a certain small degree be developed, but the circumstances hardly fall within the range of routine field practice and call for no discussion in this Report).

II. CATTLE PLAGUE.

Two separate groups of observations have been carried out; on vaccines in the Khartoum laboratory and on serum at Malakal. The point at issue in connection with the vaccine has been deterioration under selected conditions of storage, a factor requiring antecedent knowledge of the properties of freshly prepared vaccine. The work is proceeding slowly, and a progress report does not appear to be indicated.

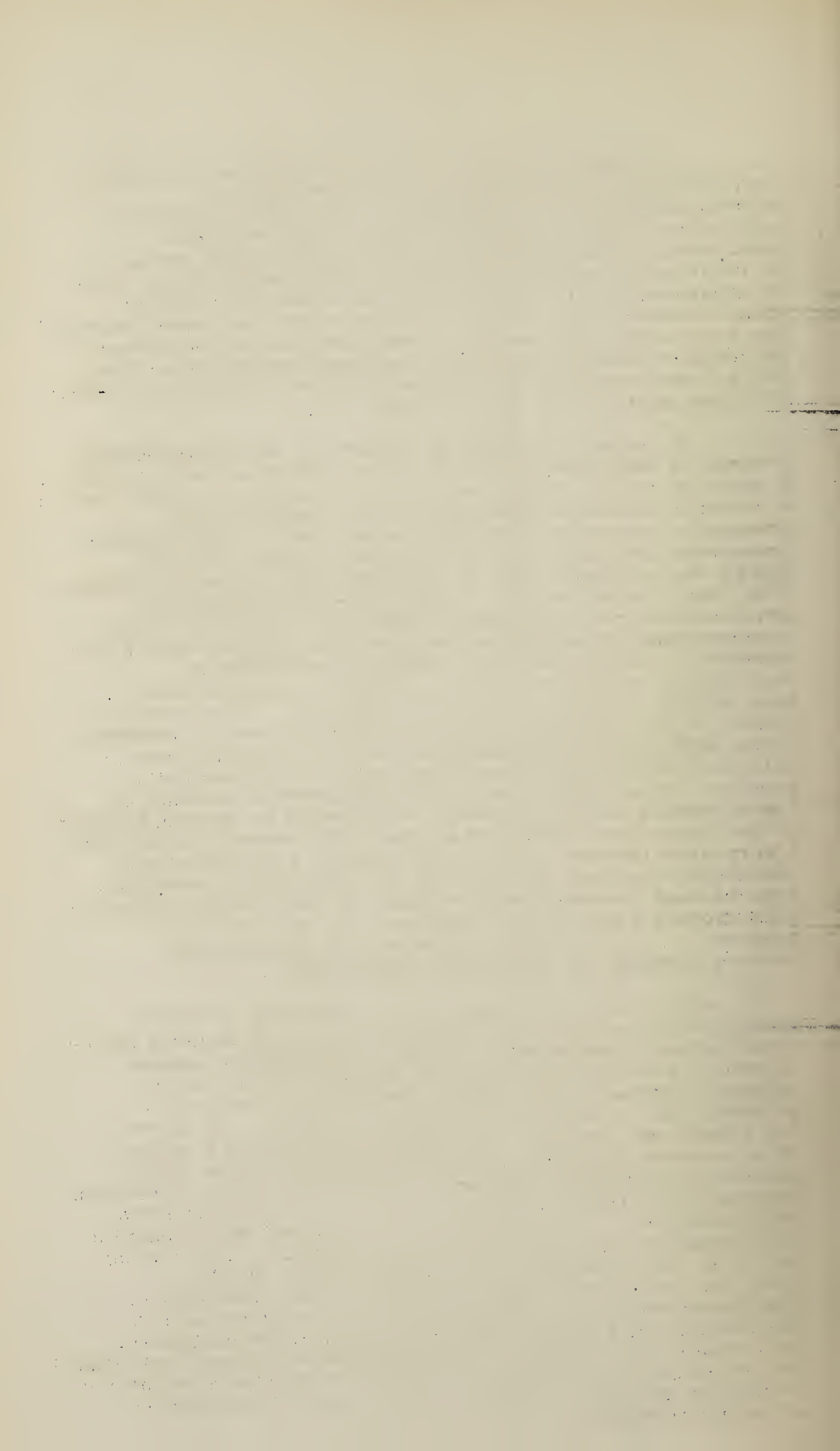
The work on serum production has been carried out at Malakal by Mr. Evans, and two fairly definite points have been established on the technique of preparation.

It is necessary to explain that apart from any question of the merits or demerits of "immune" serum, local circumstances rule out the possibility of its preparation on anything but a small scale. Observations have therefore been confined to the technique of preparing "hyperimmune" serum, and constitute sections of an extensive plan which will be followed for some years.

Since some method had to be adopted as a standard for reference it was decided, (a) to adopt the intramuscular route, as being in one's own experience surgically less objectionable than either the sub-cutaneous or intraperitoneal, while producing a serum of at least equal potency, and (b) to take as the basic rate of hyperimmunisation the very highest that the cattle would tolerate, (any lower standard would be inconclusive). The two points for immediate consideration are therefore (a) whether some better route for hyperimmunisation than the intramuscular can be adopted, and (b) whether the rate of hyperimmunisation can be reduced.

In regard to route of injection, the intraruminal process as employed in Tanganyika was studied during 1932. A group of twelve immune bulls was hyperimmunised and bled at exactly the same intervals as the routine serum producers, the only difference being that at each hyperimmunising injection the intraruminal group received double the standard dose of virulent blood (merely because they could tolerate it). Five such injections were practised, at intervals of 25 days, and the mixed serum obtained from bleedings after each dose of virus was kept separate. Later, the five samples were tested on susceptible cattle at a dosage of 10 c.c. per 100 lb. body weight, together with some controls. The serum proved in all cases of low potency; there was no apparent difference in the five samples, all were equally poor. This observation in no way negatives the Tanganyika results; it is rather that in that Territory a serum of lower potency is efficacious. Reference to Annual Reports of the Veterinary Pathologist from 1924 onwards shows that a very high recovery rate is constantly recorded among susceptible control cattle, and it seems quite probable that in such circumstances a serum of indifferent potency will protect local cattle sufficiently for practical purposes. In the Sudan, however, the intraruminal process appears not to be very promising.

Regarding the reduction of intensity of hyperimmunisation by the intramuscular route, two methods for study present themselves :- (a) To retain the maximum tolerated dose of virus but to increase the interval between injections, and (b) to retain the standard interval but to decrease the dose of virus. Of these the former was roughly tried during 1932 using a group of 40 serum producers. Five hyperimmunisations were practised at monthly intervals, with four weekly bleedings between injections. The serum from each bleeding was kept separate. Tests were finally carried out on nine mixed samples, viz : all 7th. day, 14th. day, 21st. day and 28th. day bleedings, and mixed samples of all bleedings after the 1st., 2nd., 3rd., 4th., and 5th. hyperimmunisations. Three cattle only were used for each sample, and only a dosage of 10 c.c. per 100 lb. body weight was tested. Controls were of course included. The result was that the serum proved fairly good but not so good as any one of three routine samples titrated during the season.



It is to be noted that the strictest possible comparison cannot be made between the experimental and routine serum samples because they were not all tested simultaneously. In explanation, it may be pointed out that the experiments were only of a preliminary nature, and further that in any case there seems to be no objection to referring cattle plague antiserum to a standard. In the Sudan serum for issue is titrated at three dosages, viz : 5 c.c., 10 c.c. and 15 c.c. per 100 lb. body weight. This procedure is really only necessary in order to assess especially potent or especially poor samples; in practice one virtually works to a standard, this being a serum that at dosage of 10 c.c. per 100 lb. body weight of beast will at most allow the development of the mildest of symptoms in the face of a simultaneous injection of virus.

The provisional conclusions following the season's experiments are therefore that the intraruminal process shows little promise in the Sudan, and that reduction of intensity of hyperimmunisation by increasing the intervals between injections is probably not to be recommended. The alternative method of reducing hyperimmunisation must at any rate be roughly tested before contemplating more definite experiments.

III. EPIZOOTIC LYMPHANGITIS.

Since 1927 experiments have been in progress, although in a rather discontinuous manner, to estimate the value of mercuric and potassium iodides in curing epizootic lymphangitis. Work has been carried out in both the Khartoum and Malakal laboratories and in the field, and the treatment has been administered both intravenously and by the mouth.

It is not proposed to enter into details in this Report, but the conclusions have been approximately as follows :-

- (i) Both forms of treatment are of appreciable value in that several cures were effected. There were, however, many failures.
- (ii) Both forms of treatment are objectionable from the point of view of field practice in that they have to be continued for a considerable length of time.
- (iii) The intravenous route of administration appears to be the more effective, but it is in most cases impracticable in the Sudan owing to the continuous travelling of veterinary officers and the fact that the native subordinates are not to be trusted to give intravenous injections of a highly irritant compound such as mercuric iodide.
- (iv) Even in cases which respond to the treatment there is a very considerable period over which cryptococci continue to be shed from the lesions.

The general conclusion therefore is that under Sudan conditions the treatment of epizootic lymphangitis with mercuric and potassium iodides will have a very limited field for application. The treatment will be indicated only in the case of selected animals which can be treated under proper veterinary supervision in conditions of rigid isolation. Given such conditions, the intravenous route of administration is preferably to be recommended.

IV: GLOBIDIUM INFECTIONS.

A brief note on the occurrence of these infections in the Sudan was made in this Report for 1928. At that time only two proved cases had been seen, one in a horse and one in an ox, while a third case in a donkey had been suspected. During the present year two more equine cases have been established, both of which have been sent to the laboratory for study. The first result of these studies has been a conclusion that the condition is almost certainly much commoner than is indicated by the number of cases hitherto diagnosed, and further that failure to recognise it in the past has probably been referable to lack of familiarity with the more superficial signs by which it may be clinically differentiated from other conditions which produce somewhat similar effects.

The cases studied in the laboratory have shown primarily a skin infection, although in the later stages, as shown by the cases that have been submitted to post-mortem examination, there is extension to other tissues. The skin infection when fairly advanced is not unlike diffuse ringworm, but in the early stages, when individual foci can be made out, these are seen to be very much smaller than in any ringworm infection. The series of changes in each focus is also reminiscent of ringworm. The hairs over the area become erect, and by standing out from the body of the coat are very conspicuous. Many foci can usually be seen, but in none of them are more than about a dozen hairs involved, thus differing from the ringworms in which many more are affected. The hairs are at first firmly attached and the associated skin appears normal; in a day or two, however, a sticky discharge appears at the roots of the hairs, and they become loose so that they can be easily pulled out, or if left alone they fall out, thus closely resembling ringworm on a small scale. Following the falling out of the hair nothing further is to be seen at the site unless one or two white hairs are included in those that ultimately replace the fallen ones. The appearance of white hairs is not of great diagnostic value, since it is a common phenomenon at the seat of tick bites; to a certain extent, however, the two can be differentiated because in the globidium lesions only one or two white hairs appear, whereas following tick bites there are usually several. In the hairless parts of the skin there can be no falling out of hair,

and close observation is necessary in order to follow the series of changes. A very small elevation - smaller than an ordinary pin's head - develops; in a few days this becomes sticky, and in a few more days it dries up to become a flat scab about a millimetre in diameter. Ultimately the scab falls off or is rubbed off, and in some cases (probably those in which the scab is prematurely rubbed off) a minute white scar marks the spot.

In the more advanced cases this series of changes is difficult or impossible to follow, since the skin is so intensely infected that lesions are crowded together and their individuality lost; in the hairy parts the appearance is therefore similar to diffuse ringworm, while in the hairless parts groups of lesions assume the appearance and dimensions of injuries by ticks. In extremely advanced cases the whole coat is "staring" and scurfy and the skin by repeated injury is thickened, as is easily appreciated on inspection of the eyelids, nostrils and extremities; the hairless parts of the body may be covered with large unpigmented blotches of scar tissue.

Throughout the infection there is one very remarkable feature, namely the almost complete absence of skin irritability; rubbing and biting of the skin hardly assume greater proportions than in normal animals.

Prolonged observation establishes occasional attacks of mild fever, and as the disease progresses an icteric condition develops, to be followed later by general unthriftiness and finally great muscular weakness. There is not as yet sufficient evidence to warrant any statement as to the duration of the infection or as to its final outcome, either with or without treatment; in general, however, it seems that the course is subacute or chronic, and that death is the usual termination.

Each individual lesion, as is proved by histological examination, is the site at which a minute cyst packed with spores bursts through the skin, and with this knowledge it is not difficult, when a tentative diagnosis has been made on clinical grounds, to confirm it by microscopical examination of skin scrapings. As distinguished from ringworm, if one waits until the hairs fall out it is unlikely that any diagnosis will be made except a negative one in so far as ringworm is concerned. The most effective procedure is, if the case is an early one, to choose a lesion in which the hairs are still firmly attached, to scrape very lightly for the purpose of removing hair and scurf, and then to scrape deeply. The material from the deep scraping is mixed with water and spread out on a microscope slide. In advanced cases a deep scraping from almost any part of the skin will serve, since it is then almost impossible to avoid collecting the contents of some cysts. A positive diagnosis is established by the finding of banana shaped spores, indistinguishable from sarcospores. They are preferably to be stained with haemalum or Romanowsky stains, but other basic dyes will serve.

Post-mortem examination shows the subcutaneous areolar tissue to be constantly affected, and it seems that areolar tissue in almost any part of the body may ultimately become involved. The only constant non-cutaneous site of infection hitherto recorded in all cases that have been examined has been the glottal region. It is assumed that infection settles in this area at an early stage as the result of the small amount of biting of the skin that is practised; the persistent friction between soft palate and epiglottis would favour the invasion, which would then spread in the submucous areolar tissue.

It is not necessary to describe the condition further either from a distributional or a histological standpoint, as a full publication of one's observations is already in the press. It is, however, relevant to discuss the possible economic significance of the disease in the Sudan. Of the four proved cases of the disease - i.e. proved in the sense that they have been studied ante-mortem and post-mortem in the laboratory - three have come from Southern Kordofan. The fourth case, a bull on the strength of the serum laboratory at Malakal, had also quite probably come from Southern Kordofan. In consideration of the small number of total cases hitherto established, this apparent localisation may be nothing more than coincidence, although if, as seems probable, horses are more susceptible than other species, one would expect to find more cases in areas occupied by horse breeding tribes, and in this sense it may be that Southern Kordofan is more heavily infected than other areas.

In regard to its significance in Southern Kordofan, the Senior Veterinary Inspector of the Province (Captain H.B. Williams, O.B.E.) is of the opinion that he has in the past seen many cases, but as the clinical and post-mortem features had not been worked out he was unable to establish a diagnosis. The fact that the condition runs ~~to~~ a slow course, with ultimate elimination of clinical material by death, would be sufficient explanation of the lack of notice it has attracted, the more especially as equine practice in Southern Kordofan has until recently been almost entirely confined to the relatively small number of officially owned animals. Inquiries now being prosecuted by Captain Williams among the horse owning tribes tend to show that the latter are probably well acquainted with the disease; their diagnosis is, however, not to be accepted without adequate confirmation. In an unofficial note recently received from him it is stated that "The Hawazma Arabs of Rashad Merkaz not many years ago owned between six and eight hundred horses, but now there are not fifty, and the report is that they died of this skin disease, which they call DILLAG".

It is inadvisable to develop this discussion further in the absence of a more complete survey. The past year's work has served to provide information that will facilitate clinical diagnosis, and laboratory examination will be able to confirm or refute this with absolute certainty; there will therefore be no doubt in carrying out a survey that cases reported as due to this infection will actually be such.

D. PUBLICATIONS

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Two papers have been published from the laboratory during the year :-

1. BENNETT, S.C.J. Epizootic lymphangitis : Mycelial forms of the parasite in a natural case. — Jour. Comp. Path. & Therap., 1932, Vol. 45, p. 158.
2. BENNETT, S.C.J. Contagious bovine pleuropneumonia : Control by culture vaccines. — Jour. Comp. Path. & Therap., 1932, Vol. 45, p. 257.

A publication on globidium infections is in the press.

E. SUMMARY

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The year has been characterised by an increase in all sections of routine work, except the examination of specimens, which has remained at approximately the level of last year.

Research has been continued, although with difficulty. The prophylactic value of Naganol in camel trypanosomiasis has been determined, and with this item the problem of the non tse-tse borne trypanosomiasis of camels may be considered as finally solved; studies have been carried out on globidium infections to a stage ensuring that any survey can be carried out with the certainty of accumulating accurate data; the treatment of epizootic lymphangitis with mercuric and potassium iodides has received further attention and has been found useful but of limited practicability under Sudan conditions; two potential modifications in the technique of cattle plague antiserum preparation have been studied and found unpromising, and studies on cattle plague vaccines have been continued but are as yet so incomplete

that a report on the work is not indicated.

The increases that have occurred in routine work have been considerable but not unexpectedly large. Coming, however, as they have done following upon repeated steady increases in earlier years, they have now placed the Research Section in a position in which further increases will overstrain both staff and accommodation.

In conclusion it is necessary to acknowledge the good work of the laboratory staff. Greater responsibility than usual has frequently been thrown on individuals both classified and unclassified, and their acceptance of it has enabled the laboratories not merely to comply with all routine demands, but also to carry out a certain amount of research.

Khartoum,
5.2.1933.

Sadik.

(Signed) S.O.J. Bennett

VETERINARY RESEARCH OFFICER,
SUDAN GOVERNMENT.

